Stone Tidal Weirs of East Asia in Transition

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1. Introduction

Stone tidal weir is a traditional fixed fishing trap that is constructed on seaward slopes or within fringing reefs. It is basically a semicircle-shaped or horseshoe-shaped wall made of stones or coral lime stones. And its construction has a close relationship to tidal change. The fish swim or are driven into the weir during high tide but cannot find their way out during low tide. They are then caught in the shallow water within the weir by hand or with small push net or dip net.

It is said that the stone tidal weir is the oldest fishing equipment in the world. Dr. Asahitaro Nishimura who was a maritime anthropologist and the greatest leader of research on stone tidal weir called it “a living fossil of the oldest fishing gear” (Nishimura, 1969; Nishimura, 1979).

The favorable setting for constructing stone tidal weirs is as follows (Chen, 1996):

1. The seaward slope is gentle.
2. The tidal range is wide.
3. It is easy to get many stones as materials.

Two plates show the representative stone tidal weirs of Japan that still remain. Plate 1 is called “Sukui”, which is one of the existing stone tidal weirs in the Ariake Sea in Isahaya City, Nagasaki Prefecture, western Kyushu. It has a beautiful circular-arc shape and the stone wall

is high because of the area's wide range in tides.

Plate 2 is the stone weir of Irabu Island in Miyakojima City, Okinawa Prefecture. It is constructed using coral-reef lagoons. It has two wing walls that form a V shape. The tip serves as a funnel to collect fish, and the fisher catches fish with a small set net or dip net. The stone wall is low because of the small tidal range.

In this paper, the author will discuss stone tidal weirs from the three aspects: their distribution, their present conditions in East Asia, and their preservation and reconstructions.

2. Distribution of stone tidal weirs and research on their distribution

Stone tidal weirs were once widely distributed in coastal areas with remarkable tidal action and coral reef areas with developed lagoons throughout the world. Figure 1 shows the areas in which stone tidal weirs were distributed (Tawa, 2007). These areas include the East Asian region such as southwestern Japan, the southwestern Korean Peninsula, Taiwan, and middle China, the Southeast Asian region centered around the Philippines, the expansive South Pacific regions of Micronesia (Plate 3), Melanesia, and Polynesia, and also Mauritius in the Indian Ocean, the Bay of Biscay in western France (Plate 4) and the southern part of Spain facing the Atlantic Ocean, which are like enclaves.

We know that in Japan, stone tidal weirs were once found in large numbers in western Kyushu and the Okinawa and Yaeyama Islands. It has also been long known that stone tidal weirs were distributed throughout the East China Sea and its surrounding areas, especially Taiwan and Korea (Figure 2). However, little research has been done on

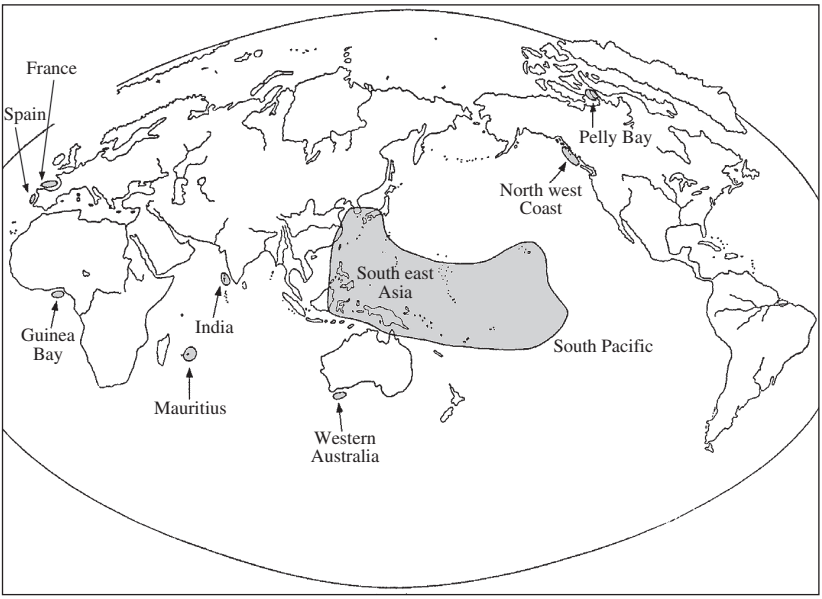

Figure 1 Distribution of Stone Tidal Weirs in the World

these weirs, and only from very recent research have we come to know that many stone tidal weirs still exist today.

In Japan, research on stone tidal weirs, mostly by Dr. Nishimura, was undertaken from the 1960s to the 1970s. Dr. Nishimura and his disciples analyzed the construction, ownership, and other aspects of weirs in western Kyushu, the islands of Okinawa, and other areas (Nishimura, 1969; 1979; Mizuno, 1980; Yano, Nakamura, and Yamazaki, 2002), while observing the fishing culture with an ecosystem of fringing reefs distributed widely throughout Oceania (Nishimura, 1974).

Entering the 1980s, research on stone tidal weirs in Japan nearly came to a halt. The author believes there are two reasons for this. One is that the research by Dr. Nishimura and his disciples came to a certain terminal point. Another reason is innovations in the inshore fisheries.

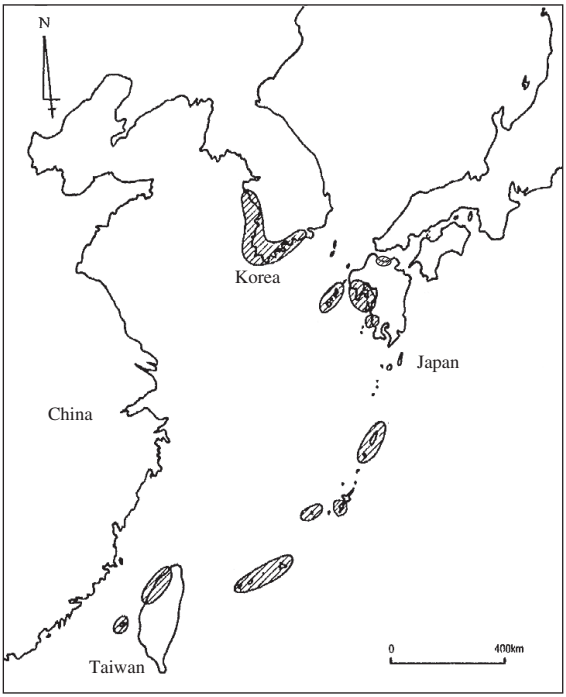

Figure 2 Distribution of Stone Tidal Weirs in East Asia

Stone tidal weirs gradually lost their effectiveness as fishing tools and began to disappear due to the transition toward the primary use of more productive fishing boats.

Next, the author will discuss about Taiwan. In Taiwan, the Penghu Archipelago in the Strait of Taiwan is the region with the world's largest concentration of stone tidal weirs, with over 500 weirs in total. The western coastal region of the main island is another area where a large number of weirs were once distributed, with some remaining today.

In the latter half of the 1980s, geographers in Taiwan began their survey, and the author also surveyed stone tidal weirs along the northwestern coast of the main island. Entering the 1990s, active research

began on stone tidal weir fishing in the Penghu Archipelago (Chen, 1992; 1996). In recent years, research has also proceeded to a complete enumeration of stone tidal weirs, with the participation of not only researchers but also local school teachers and their students. This research has led to a reexamination of the inherent culture of Taiwan, as well as clarification of the use of fishing villages and grounds in the Penghu Archipelago (Hong, 1999).

In Korea, stone tidal weirs were distributed along the western coast facing the Yellow Sea, as well as the deeply-indented ria coastline of the southern area facing the Tsushima Straits, including the provinces of South Chungcheong, North Jeolla, South Jeolla, South Gyeongsang, and

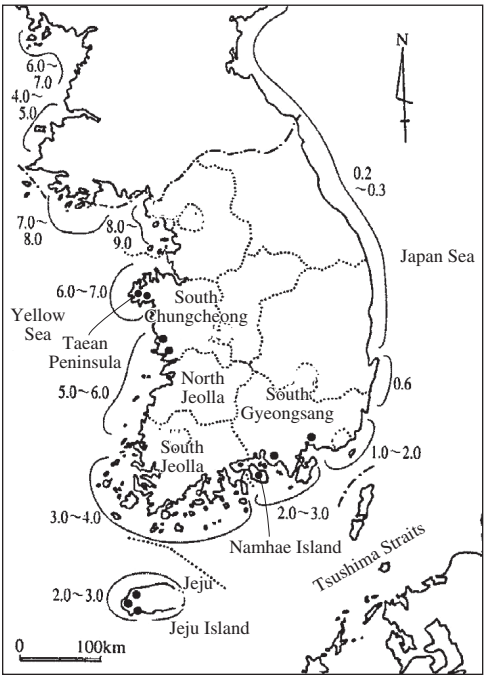

Figure 3 Distribution of Stone Tidal Weirs in Korea
The figures in the map represent the tidal range.

Jeju Island (Figure 3). An urgent survey was conducted in the 1990s on stone tidal weirs, through which it became known that many stone tidal weirs existed and were still in use. According to the latest data received in November 2006 from Dr. Lee Sang-Go, a scholar of fisheries management at Pukyong National University in Busan, there are five stone tidal weirs off Namhae Island (Plate 5), three off Jeju Island, and six or seven off the Taean Peninsula.

Stone tidal weirs have tremendous value as artifacts of the culture and tradition of fishing communities. Therefore, the need to find ways to protect the remaining weirs from destruction and to establish means for weirs to be used for the education of the Korean people has also been highlighted in Korea.

3. Preservation and Reconstruction of Stone tidal weirs

From stone tidal weirs, we can understand a wide range of fishing cultures, composed primarily of fishing communities, as well as the importance of "local knowledge" (Berkes, 1999) as seen in traditional fishing. Thus, the stone tidal weirs are extremely valuable not just as cultural artifacts of equipment used for fishing, but also as a means to hand down the traditional culture of fishing communities to future generations.

There needs to be a method developed soon to prevent any further destruction to the remaining stone tidal weirs. Also, we can foresee the need to establish a means to use the weirs that are still used as educational materials. Two new ideas worth considering are preserving them as cultural assets and utilizing them as tourist attractions.

The stone tidal weirs of Japan have become outdated, and very few

remain today. The remaining stone weir of Isahaya City was designated as cultural asset by the city on April 11, 1986. It is being preserved while it is used; in other words, it is under dynamic preservation. Also, in April 2005, thanks to a revision in a portion of the Law for the Protection of Cultural Properties in Japan, the concept of a cultural landscape was raised. This idea refers to the scenery comprised of the daily lives or livelihoods of the people as well as the local climate and topography of the region. And it was established with the goal of preserving something that could not be lost in order to understand the people's daily lives and livelihoods. In the committee that preceded this revision, the stone tidal weirs of Amami-Oshima Island in Kagoshima Prefecture and Kohama Island (Plate 6) in the Yaeyama Islands of Okinawa Prefecture, and additionally the stone weir of Isahaya City were designated as subjects for secondary research, following the regions of greatest importance, in June 2003.

Also, in February 2006, the Fisheries Agency of the Ministry of Agriculture, Forestry and Fisheries designated fishing village facilities they wish to preserve for the future as "The 100 Best of Fishing Villages and Fisheries" to convey the beauty of fishing villages and further stimulate relations between regions. Among those, the stone tidal weirs of Isahaya City and Irabu Island in Miyakojima City were chosen.

Additionally, in the Shiraho region of Ishigaki Island in Okinawa Prefecture, movements began in 2006 to restore the stone tidal weir that was once there (Plate 7). There has been a sharp decline in the fish and seaweed catch in the lagoon (called *Inoh*) that was once a productive fishing area, and this area has primarily become a leisure spot for scuba diving and canoeing, etc. The local children think of the lagoon with its blue coral as just a beautiful nature spot, and there is no way for them to

know that it was once a productive area. Behind the restoration of the stone tidal weir is other goal including reconsidering the relationship between people and the *Inoh* lagoon and maintaining the coral reefs.

Also in the Penghu Archipelago in Taiwan, stone tidal weirs have been given new value in recent years. A new awareness has emerged that weirs are valuable assets of traditional fishing culture, and that they hold value for cultural education as well. Ideas have been presented to collect money from tourists and make stone tidal weir fishing a hands-on tourist activity. The plan is to give visitors dip nets, allow them to actually catch fish, then to cook and serve the fish they catch. In doing so, stone tidal weirs could serve as a means to bring in tourists. According to the information on stone tidal weirs collected from tourist guidebooks and pamphlets in the Penghu Archipelago from the 1980s to 2002, almost all of the stone weirs listed until the 1990s were the heart-shaped one (Plate 8), located near Chih-mei Island, remote island off the southernmost part of the Penghu Archipelago. The shape of this weir is considered one of the most beautiful, and enjoying this view is one of the selling points for tourism in this island. In these guidebooks and pamphlets, there is almost nothing written about the fishing activity of stone tidal weir. However, since 2000 there has been some information provided about hands-on fishing experience, and there are even pictures showing local fishers and tourists catching fish in the weirs to give tourists a better idea of what it is like (Tawa, 2003).

4. Conclusion

Looking at these changes of utilization of stone tidal weirs, the author can assume that a new significance has been given to them, which had

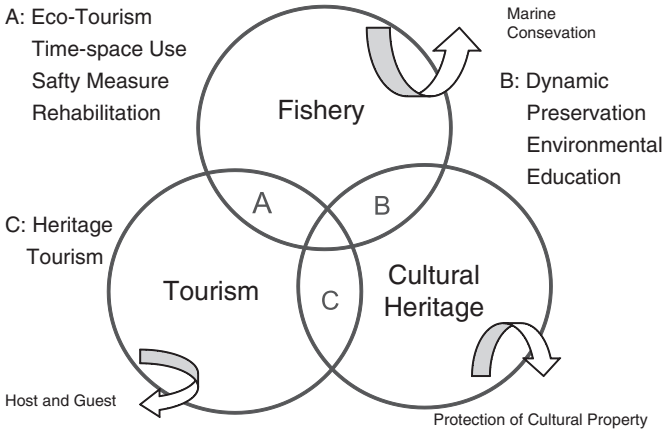

Figure 4 Conservation and Rehabilitation of Stone Tidal Weir

lost their value as one of the fundamentals of fishing, and that the weirs have been "rediscovered" through tourism (Plate 9).

Local people, local government officials and academic researchers, must discuss the problems about how to make efficient of stone tidal weirs; cultural and historical heritage, symbol of marine resource management, tool for environmental education, tourist attraction, and tool for regional revitalization (Figure 4).

Research on stone tidal weirs began as an analysis of ownership of fishing grounds and has led to a greater understanding of fishing activities as well as use of fishing grounds. The author believes this research is now at a stage where it will include new perspectives of study and achieve even greater results.

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Plate 1 Stone tidal weir "*sukui*" in Ariake Sea, Nagasaki Prefecture (2005)

Plate 2 Stone tidal weir in Irabu Island, Okinawa Prefecture (2005)

Plate 3 Arrow trap "*atch*" of Yap Island in the Caroline Islands (2007)

Plate 4 Stone tidal weir "Les écluse à poissons" in the Isle of Ré, France (2009)

Plate 5 Stone tidal weir in Namhae Island, Korea (Photo by Dr. Lee Sang-Go)

Plate 6 Stone tidal weir in Kohama Island, Okinawa Prefecture (2004)

Plate 7 Reconstruction of stone tidal weir in Shiraho, Ishigaki Island, Okinawa Prefecture (2006, Fhoto by WWF)

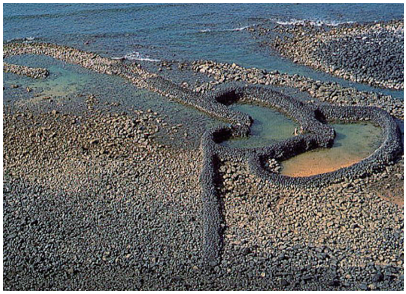

Plate 8 Heart-shaped stone tidal weir of Chih-mei Island in the Penghu Archipelago, Taiwan (Photo by Dr. Cheng Hsien-Ming)

Plate 9 Hands-on fishing in the stone tidal weir in Tomie, Goto City, Nagasaki Prefecture (2009)